

Supplemental Material for:
**Development of a Hydrogen Sulfide End-of-Service-Life Indicator
for Respirator Cartridges using Cobinamide**

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Figure S1: A. 50.0 μM $\text{OH}(\text{H}_2\text{O})\text{Cbi}$ solution. B. $\text{OH}(\text{H}_2\text{O})\text{Cbi}$ with 5:1 ascorbic acid to Cbi (aerobic conditions). C. $\text{OH}(\text{H}_2\text{O})\text{Cbi}$ with 5:1 ascorbic acid to Cbi (anaerobic conditions).

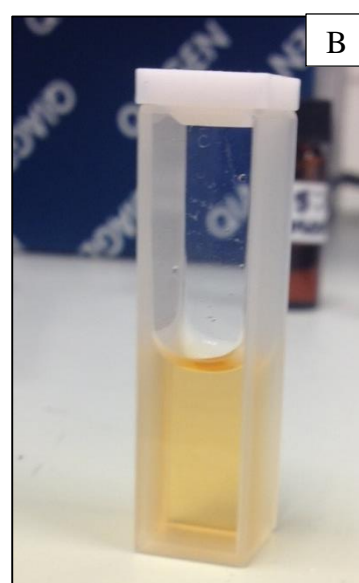
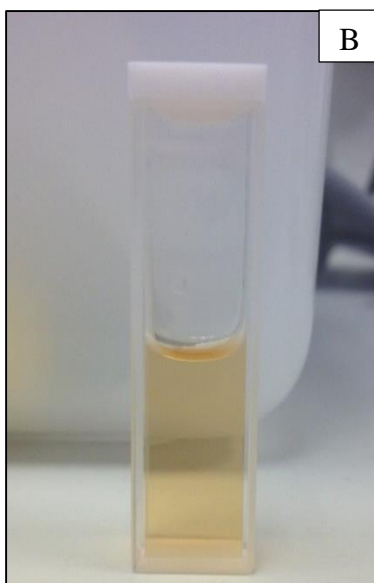
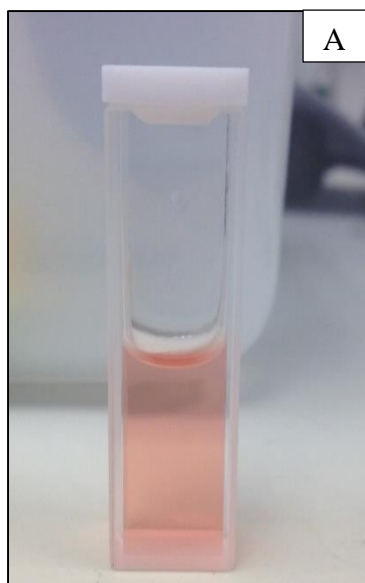


Figure S2: Depiction of sensor holder. A. View of flow-through sensor holder with lid on top. B. Looking down at sensor holder, with lid on right with quarter as reference for size. C. Looking down on blank glass fiber filter paper inserted into the holder with light on.

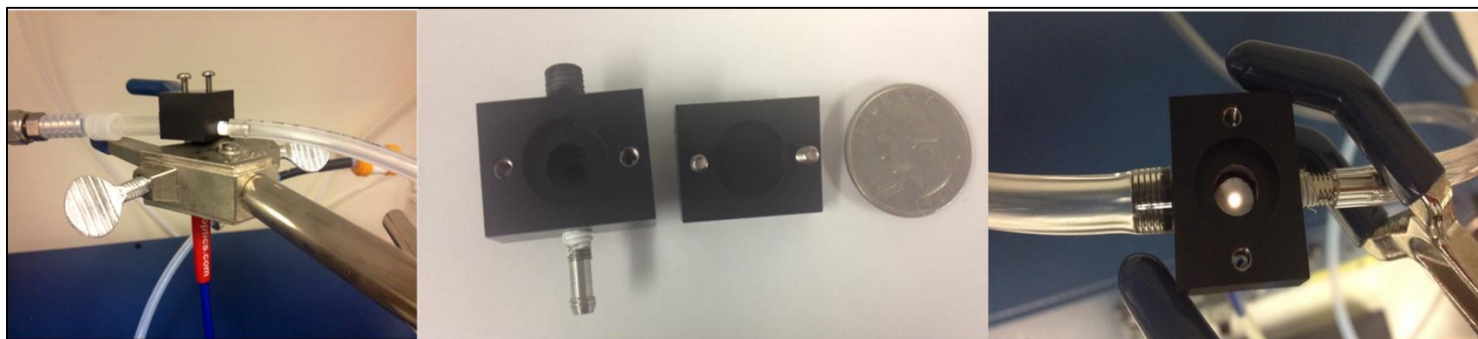


Figure S3: Comparison of 50.0 μM $\text{OH}(\text{H}_2\text{O})\text{Cbi}$ in solution plotted as absorbance (A), and fixed onto glass fiber paper plotted as the Kubelka-Munk function for diffuse reflectance (B).

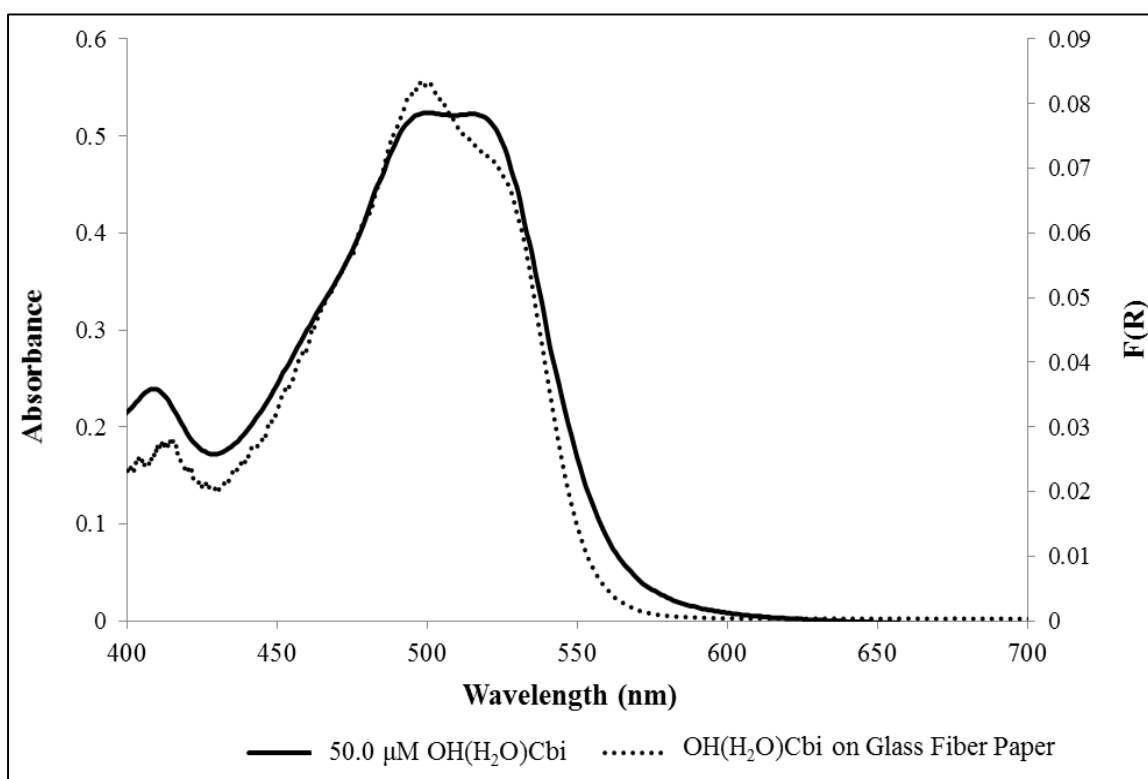


Figure S4: Average F(R) values from 400–450 nm (triangle) and 470–550 (circle) for OH(H₂O)Cbi on paper when exposed to 10.0 ppm H₂S for 1, 5, 10, and 15 mins at 25 %RH. Uncertainty is in terms of 95 % CI for n=3.

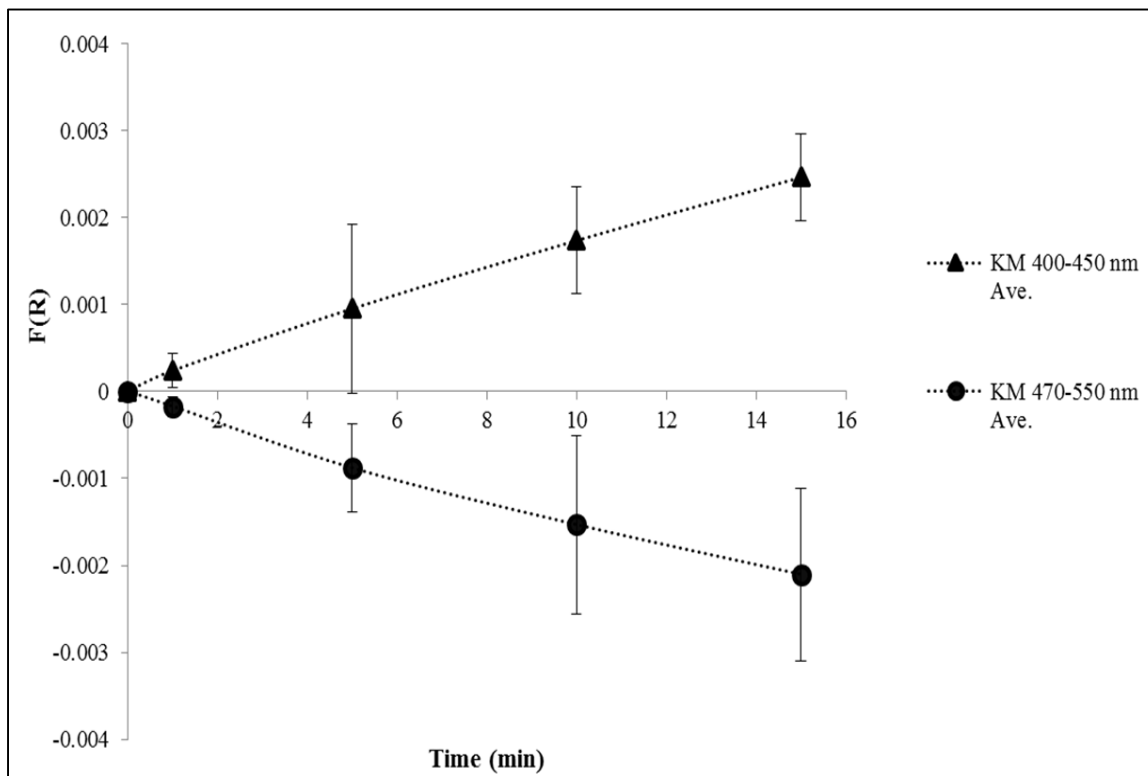


Figure S5: Diffuse reflectance spectra when the reflectance spectrum of aquohydroxocobinamide on glass fiber filter paper was designated as the “blank” (dashed-circle line) and response to 10.0 ppm H₂S exposure on glass fiber filter paper as a function of time of exposure at 50 %RH: 1 min of exposure (dotted line), 5 min of exposure (short dashed line), 10 min exposure (long dashed line), and 15 min (solid line).

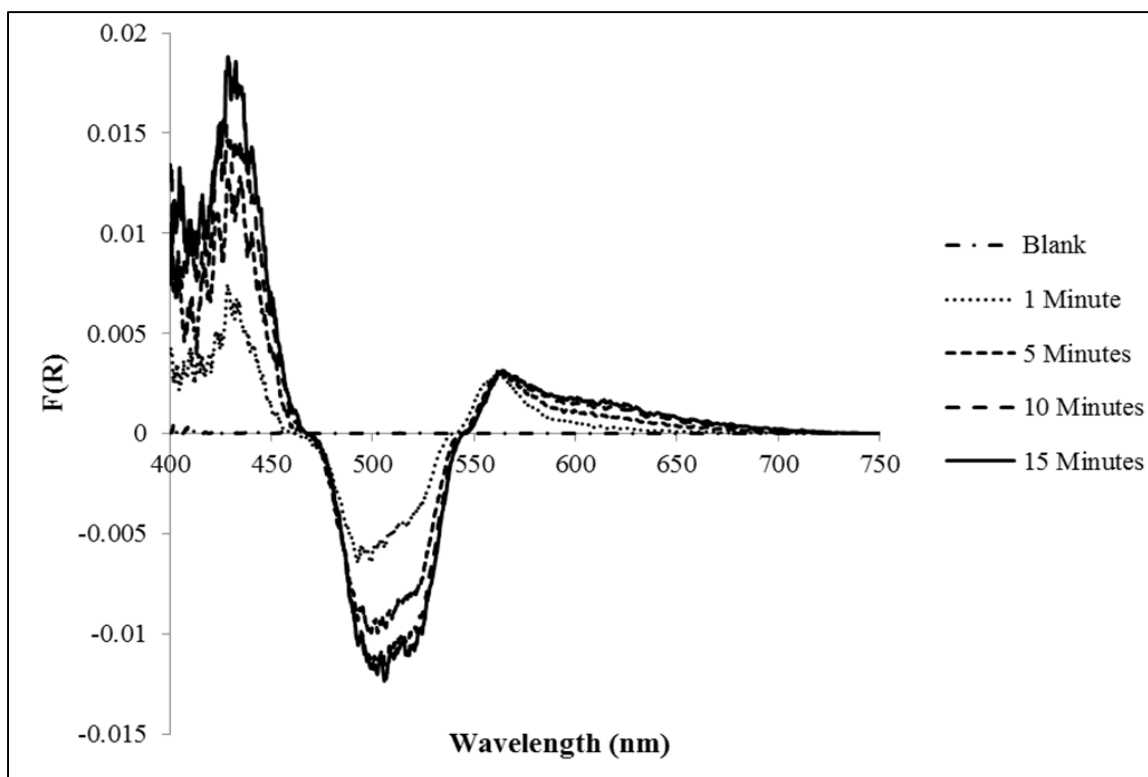


Figure S6: Average $F(R)$ values from 400–450 nm (circle) and 470–550 (square) for $\text{OH}(\text{H}_2\text{O})\text{Cbi}$ on paper when exposed to 10.0 ppm H_2S for 1, 5, 10, and 15 mins at 50 %RH. Uncertainty is in terms of 95 % CI for $n=3$.

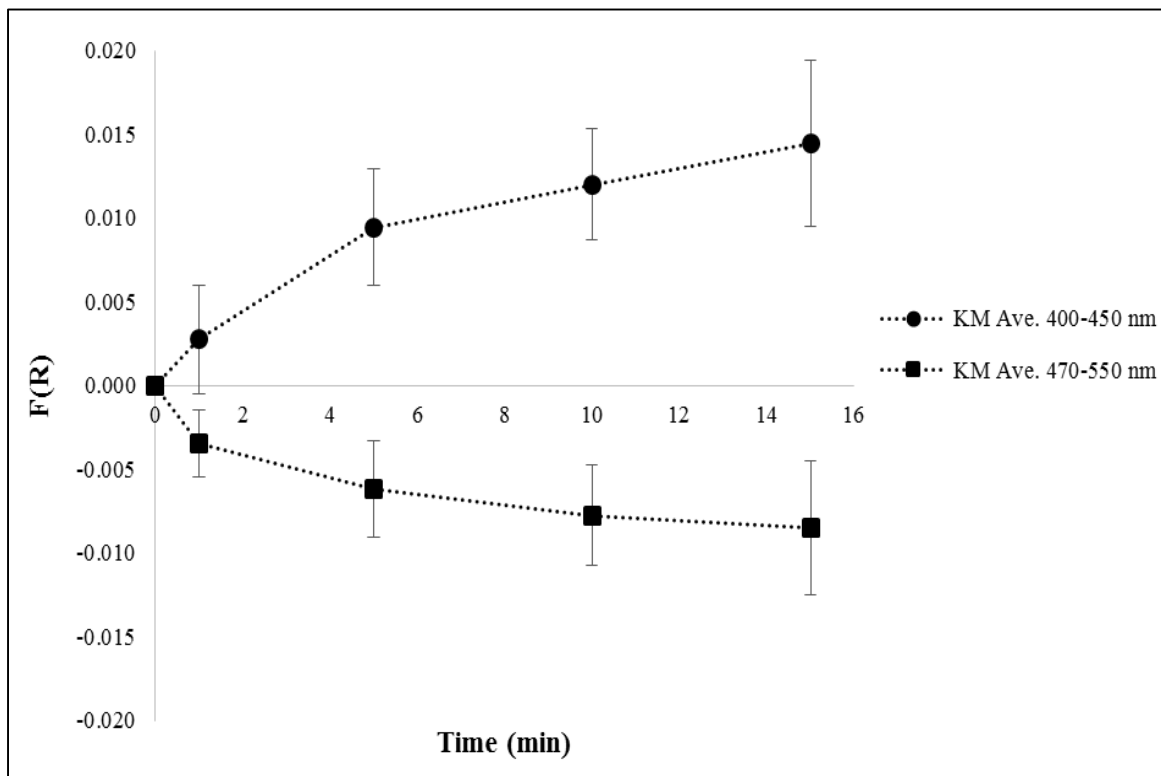


Figure S7: Comparison of the diffuse reflectance spectrum of OH(H₂O)Cbi on glass fiber paper exposed to H₂S at 50 %RH (dashed line) after 15 min and reflectance spectrum of CN(H₂O)Cbi on glass fiber paper exposed to HCN at 50 %RH (dotted line) after 15 min. Glass fiber paper was subtracted out and referred to as the blank (solid line).

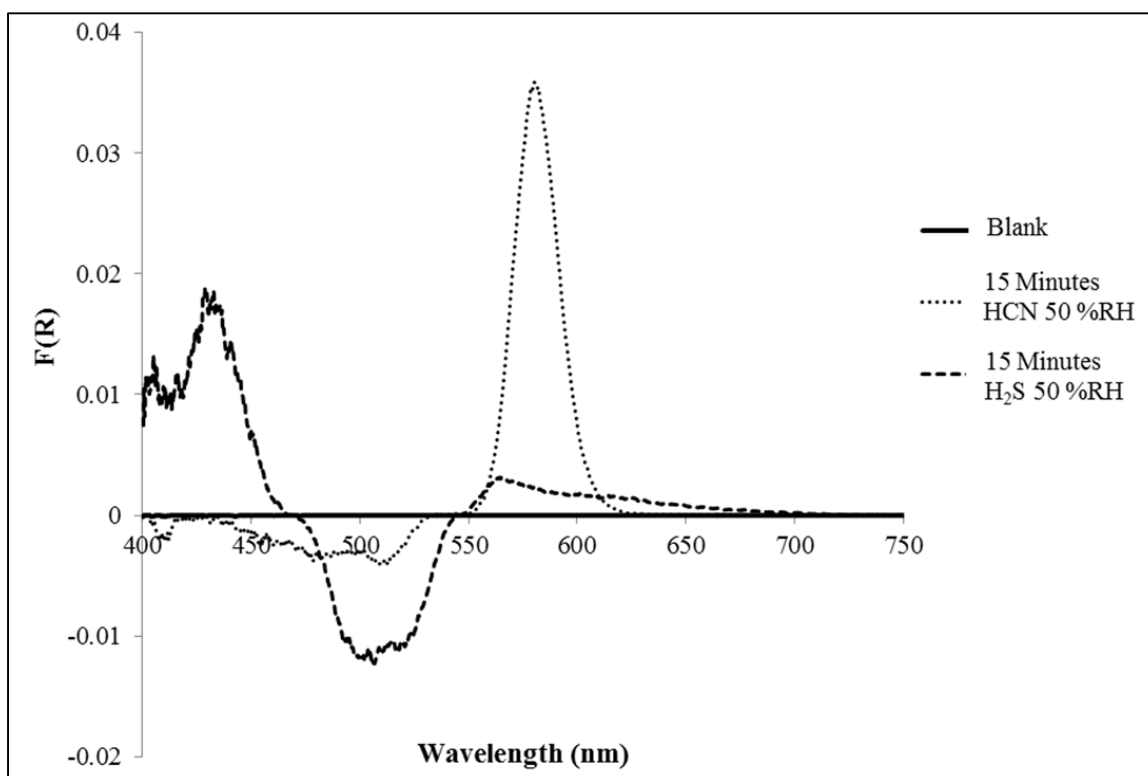


Figure S8: UV/Vis spectrum of 50.0 μM OH(H_2O)Cbi before (solid line) and after mixing with 1:1 ascorbic acid to Cbi (dotted line) and 5:1 ascorbic acid to Cbi (dashed line) under anaerobic conditions.

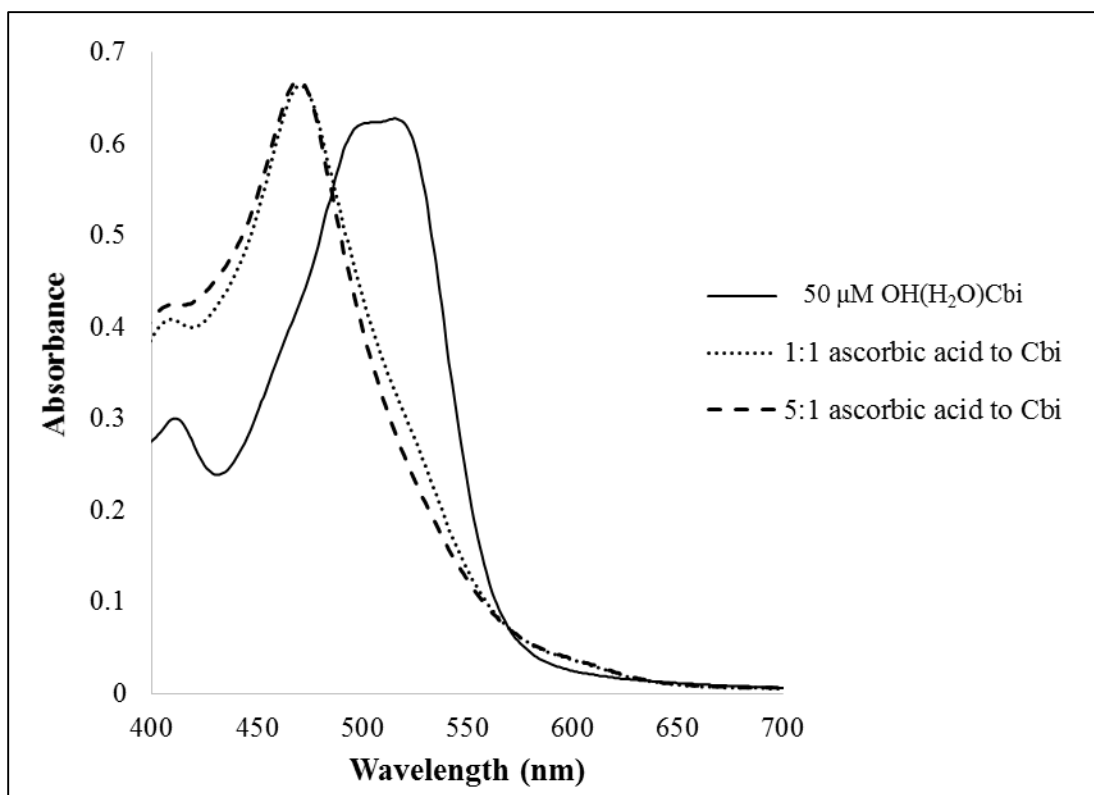


Figure S9: Comparison of the diffuse reflectance spectrum of OH(H₂O)Cbi on glass fiber paper exposed to H₂S at 85 %RH (dashed line) after 15 min and reflectance spectrum of CN(H₂O)Cbi on glass fiber paper exposed to HCN at 85 %RH (dotted line) after 15 min. OH(H₂O)Cbi on glass fiber paper was subtracted out and referred to as the blank (solid line).

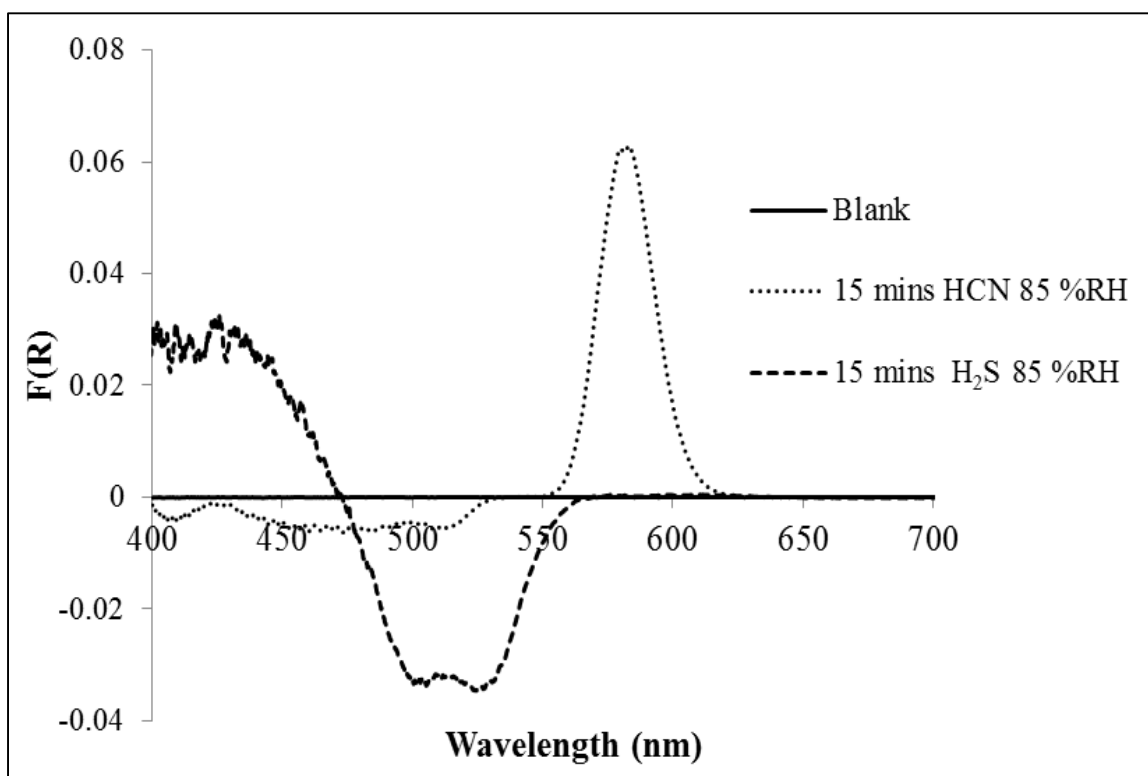


Figure S11: A. Comparison of breakthrough curves of the electrochemical detector (dotted line, plotted as a 5-point moving average, and Cbi paper sensor at 583 nm plotted as a polynomial. B. Diffuse reflectance spectra at various time exposures throughout the experiment (15, 30, 60, 105 minutes, and at 10.0 ppm H₂S breakthrough (164 min)).

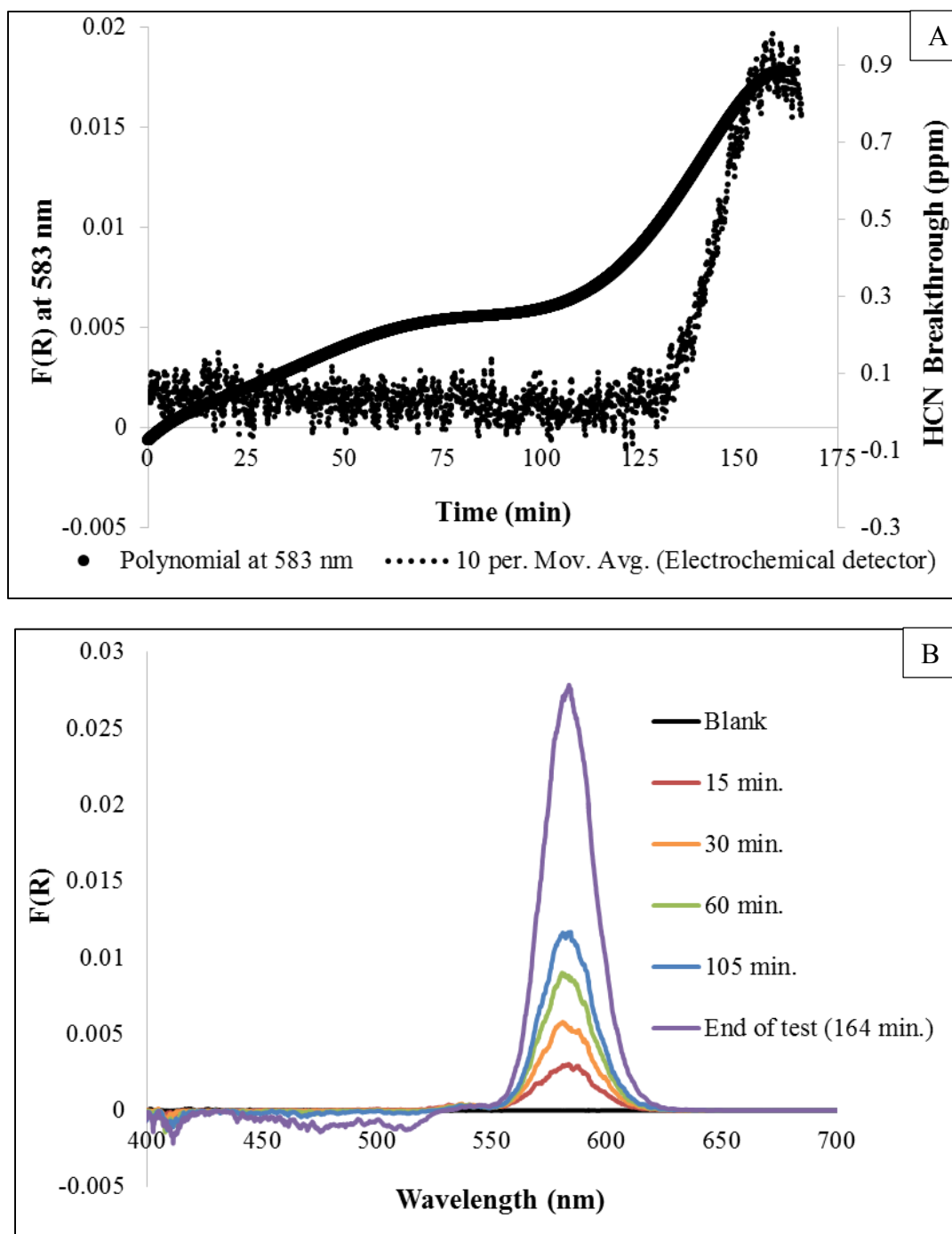


Figure S12: Electrochemical detector breakthrough curve for respirator cartridges exposed to 85 %RH. Inset text box: H₂S concentration (ppm) at specific time points within the experiment.

